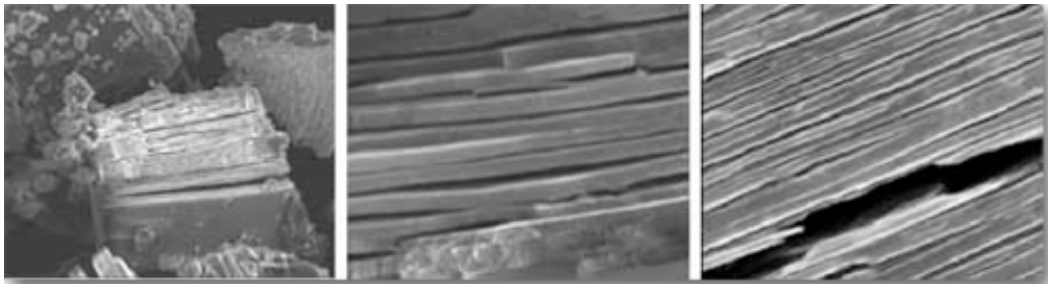
LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: Aug. 4-11, 2008.

Assessing cracking in nanostructures



Scanning electron microscope images of a cerium hydride stacked-plate nanostructure showing fracture scales.

Certain sizes of nanostructures may be more susceptible to failure by fracture than others.

That is the result of new research by LLNL's Michael Manley and colleagues from Los Alamos National Laboratory that appears as a Rapid Communication in the journal *Physical Review B.*

As the size of a structure gets to the nanoscale, atomic vibrations (also known as phonons) begin to feel its size and shape in an effect called phonon confinement.

While these effects play an important role in thermal transport, electronic processes and thermodynamic stability, not much is known about their role in fracture.

However, in the new research, the scientists found that at a certain thickness, excess entropy of the confined vibrations reduces the fracture energy and results in a size-specific fracture.

"When the fracture results in nanoplates, it leads to a low level of fracture energy at a certain size, resulting in a size-specific fracture," Manley said. "This has important implications for the design of nanostructures."

For more information, see https://publicaffairs.llnl.gov/news/news_releases/2008/NR-08-08-01.html

Director George Miller upbeat about the Laboratory's future

George Miller

In an upbeat address to employees last week, Director George Miller said "we're doing well" and that there is growing recognition in Congress of the important role Laboratory science and technology plays in "developing solutions to the nation's most pressing problems."

"Congress is clearly paying attention to sustaining America's scientific and technical talent," Miller said after describing two congressional hearings this year at which he testified. "Congress clearly recognizes the contributions the national laboratories have made and the importance of sustaining our core missions and of being agile and flexible so that we can help solve the broad set of issues facing this country."

During his address, Miller honored Lab researchers who have received recognition for their work and introduced a video tribute.

For more, see *Newsline* at https://newsline.llnl.gov/

Valy Oxford of Homeland Security visits the Laboratory

Vayl Oxford (center), director of the Domestic Nuclear Detection Office within the Department of Homeland Security, visited LLNL last week. Here, he views a purported uranium canister associated with nuclear black market activities. Showing him the canister was Rob Allen, associate program leader at LLNL for Nuclear Assessment Operations. They are flanked by John Doesburg (far right), principal associate director for Global Security, and Mike Carter, deputy principal associate director for programs, also within Global Security.

Photo of the week

Rapid response

Rich Whipple, a chemist in Lawrence Livermore National Laboratory's Forensic Science Center (FSC), is shown preparing a glove box for use inside the FSC's mobile response van.

Photo by Jacqueline McBride

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LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

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